Chapter : 12. GEOMETRICAL CONSTRUCTIONS

Exercise : 12A

Question: 1

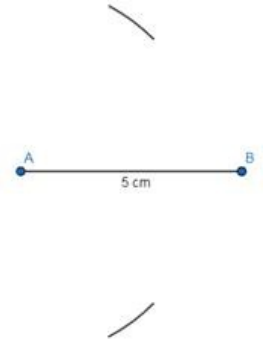
Draw a line segme

Solution:

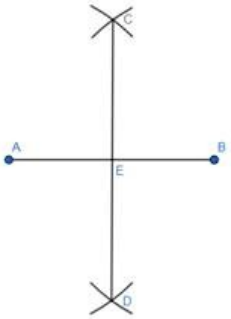
Steps of Construction:

1. Draw a line segment AB = 5 cm

2. With A as centre and radius equal to more than half of AB, draw two arcs, one above AB and one below AB.



3. With B as centre and the same radius draw two arcs which cut the previously drawn arcs at C and D.



4. Join CD, intersecting AB at E.

Therefore, CD is the perpendicular bisector of AB at point E.

Question: 2

Draw an angle of

Solution:

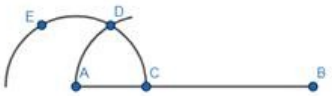
Steps of Construction:

1. Draw line segment AB.

2. With A as centre and any suitable radius draw an arc, cutting AB at C.

3. With C as centre and the same radius, cut the previously drawn arc at D.

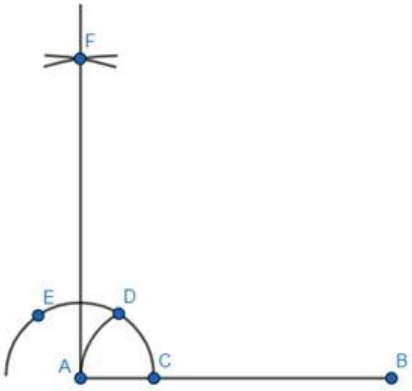
4. With D as centre and the same radius, cut the arc at E.



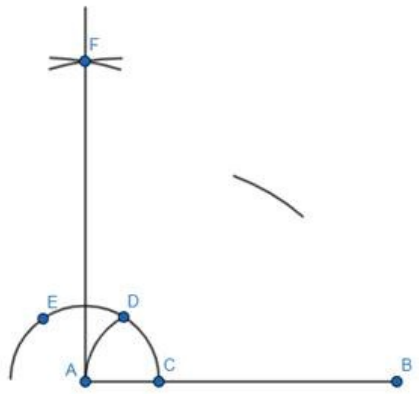
5. With D as centre and the radius more than half DE, draw an arc.

6. With E as centre and the same radius draw another arc which cuts previous arc at F.

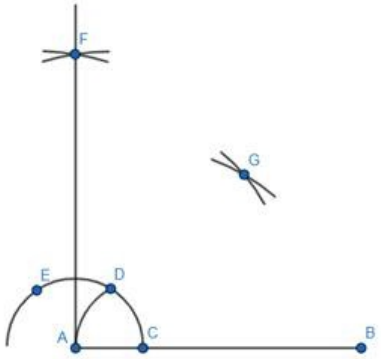
7. Join F. So, ∠BAF = 90°



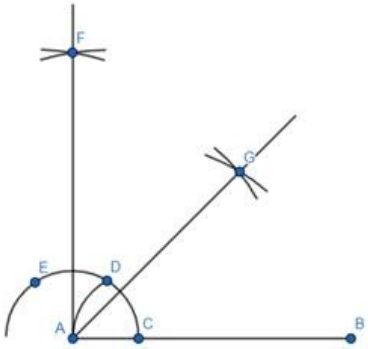
8. Now with C as centre and radius more than half of DC draw an arc.



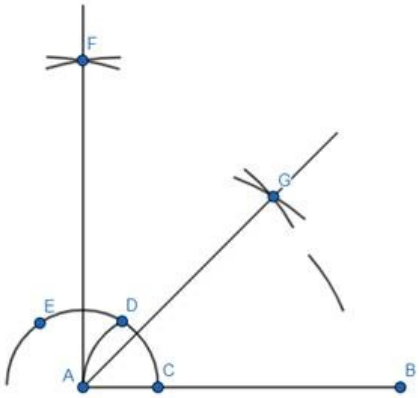
9. With D as centre and same radius draw an arc which cuts the previous at G.



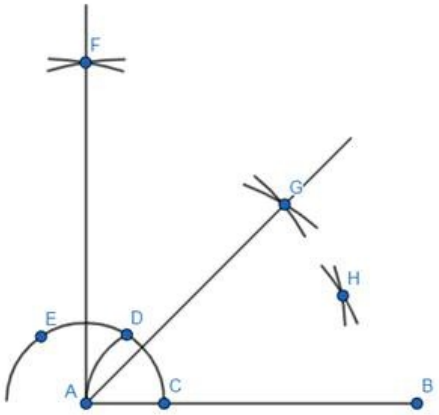
10. Join AG. Therefore, it is the bisector of ∠ BAF, i.e., 45°



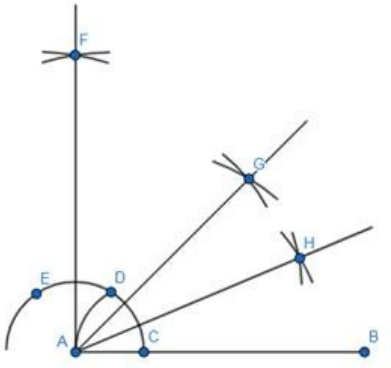
11. Now with centre C and radius more than half of CD, draw an arc.



12. With centre D and same radius draw another arc which cuts the previously drawn arc at H.



13. Join AH.



Therefore, AH is the bisector of ∠BAG.

Question: 3

Construct an angl

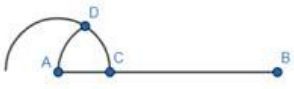
Solution:

Steps of Construction:

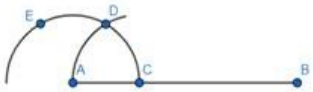
1. Draw line segment AB.

2. With A as centre and any suitable radius draw an arc, cutting AB at C.

3. With C as centre and the same radius, cut the previously drawn arc at D.



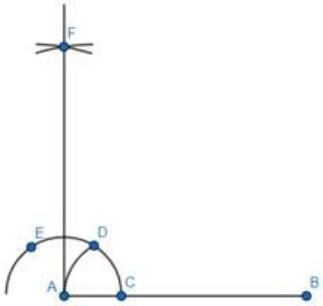
4. With D as centre and the same radius, cut the arc at E.



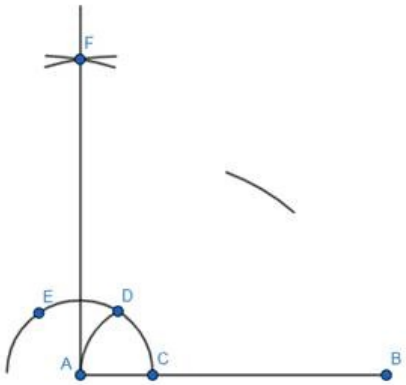
5. With D as centre and the radius more than half DE, draw an arc.

6. With E as centre and the same radius draw another arc which cuts previous arc at F.

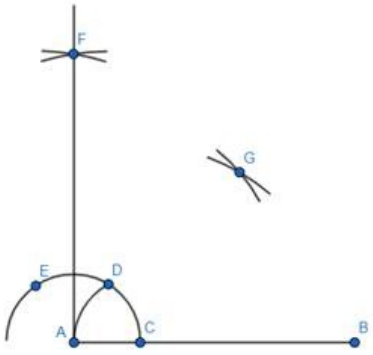
7. Join F. So, ∠BAF = 90°



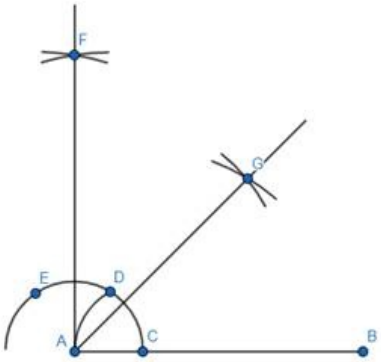
8. Now with C as centre and radius more than half of DC draw an arc.



9. With D as centre and same radius draw an arc which cuts the previous at G.



10. Join AG. Therefore, it is the bisector of ∠ BAF, i.e., 45°



Question: 4

Construct an equi

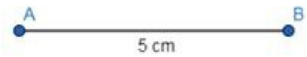
Solution:

Steps for Construction:

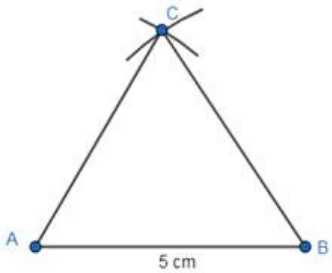
1. Draw a line segment AB = 5 cm.

2. With A as centre and radius equal to AB draw an arc.

3. With B as centre and the same radius draw another arc which cuts the previous arc at C.



4. Join AC and BC.



Then ΔABC is the required equilateral triangle.

Question: 5

Construct an equi

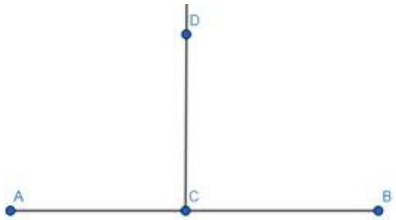
Solution:

Steps for Construction:

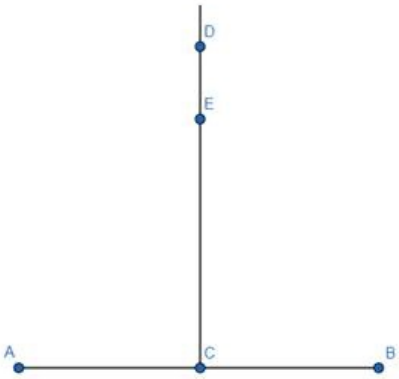
1. Draw a line AB.

2. Mark any point C on it.

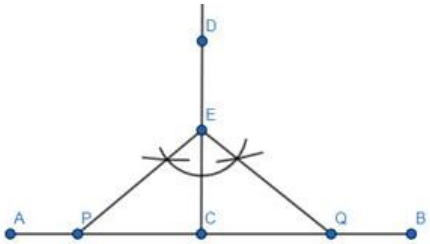
3. From C, draw CD perpendicular to AB.



4. From C, set off CE = 5.4 cm cutting CD at E.



5. Construct ∠ CEP = ∠ CEQ = 30° meeting AB at P and Q respectively.



Therefore, Δ PEQ is required equilateral triangle.

Question: 6

Construct a ΔABC

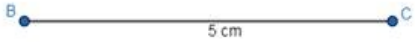
Solution:

Steps for Construction:

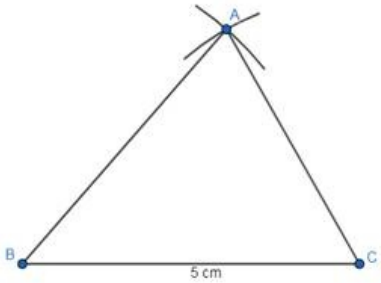
1. Draw a line segment BC = 5 cm.

2. With centre B and radius equal to 3.8 cm draw an arc.

3. With centre C and radius equal to 2.6 cm draw another arc which cuts the previously drawn arc at A.



4. Join AB and AC.



Therefore, Δ ABC is the required triangle.

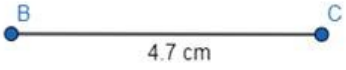
Question: 7

Construct a ΔABC

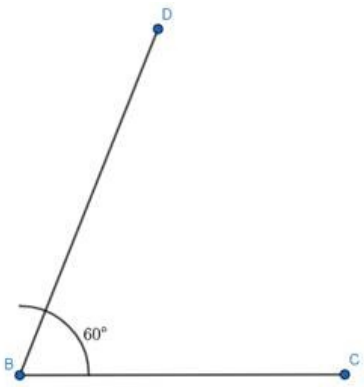
Solution:

Steps for Construction:

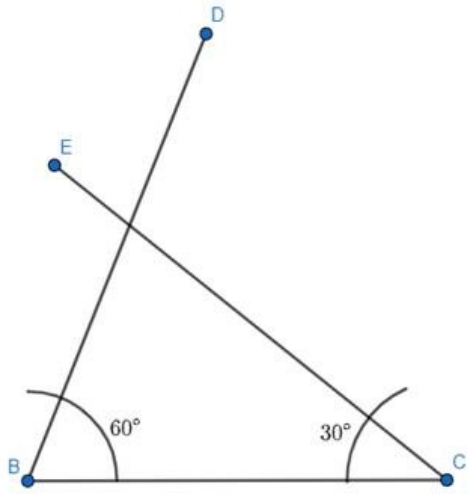
1. Draw a line segment BC = 4.7 cm



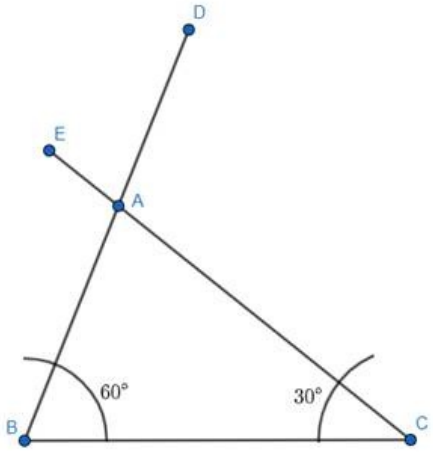
2. At B, draw ∠DBC = 60°



3. At C, draw ∠ECB = 30°



4. Let DB and EC intersect at A.



Therefore, Δ ABC is the required triangle.

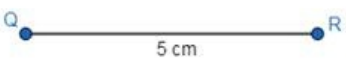
Question: 8

Construct an isos

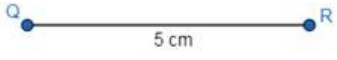
Solution:

Steps of Construction:

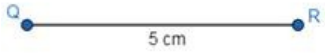
1. Draw a line segment QR = 5 cm which is the base.



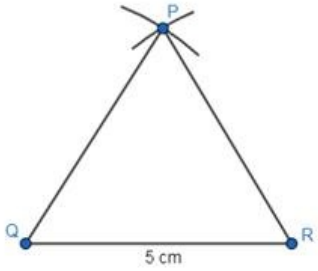
2. With centre Q and radius 4.5 cm, draw an arc.



3. With centre R and same radius, draw another arc which cuts the previous arc at P.



4. Join PQ and PR.



Therefore, Δ PQR is the required isosceles triangle.

Question: 9

Construct an isos

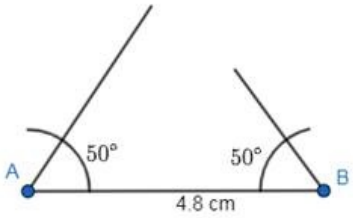
Solution:

Since one of the angles is 80°, the sum of the other two will be 100°. It is isosceles. So, the other angles will be 50° and 50°.

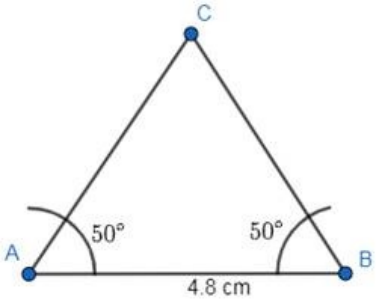
Steps of Construction:

1. Draw a line segment AB = 4.8 cm.

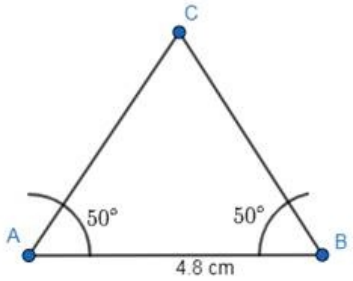
2. Draw 50° angles at A and B.



3. Extend them such that they meet at C.



4. Join AC and BC.



Therefore, Δ PQR is the required isosceles triangle in which AC = BC.

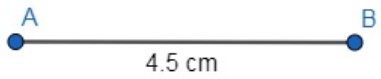
Question: 10

Construct a right

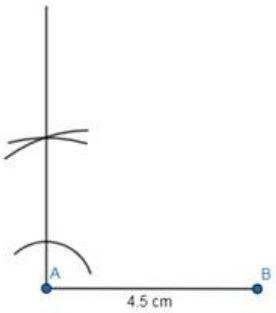
Solution:

Steps of Construction:

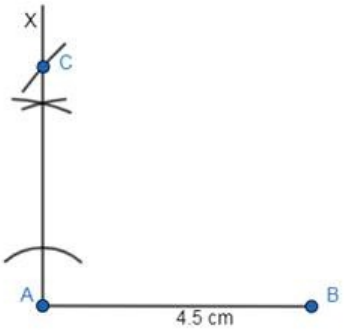
1. Draw a line segment AB = 4.5 cm.



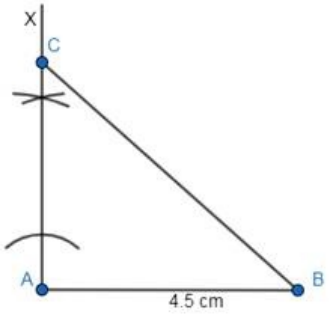
2. Draw a 90° angle at A.



3. Now, measure 5.3 cm on compass from ruler and taking B as centre draw an arc intersecting AX at C.



4. Join BC.



Question: 11

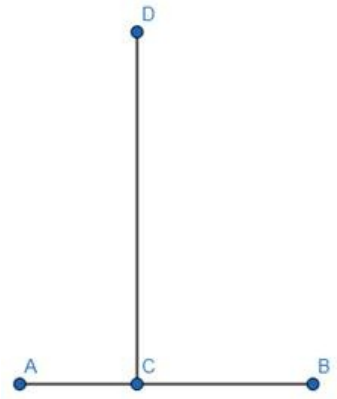
Construct a ΔABC

Solution:

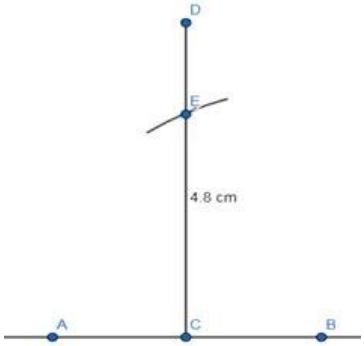
Steps of Construction:

1. Draw a line segment AB.

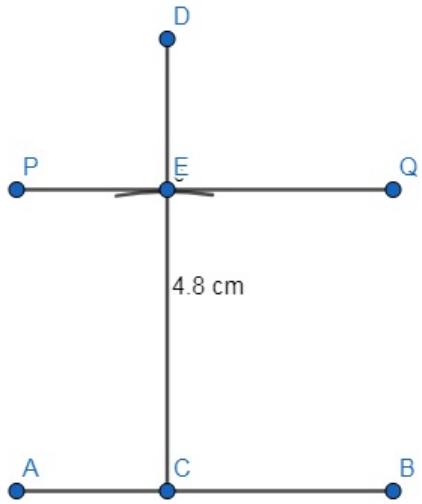
2. Take any point C on AB and draw CD perpendicular to AB.



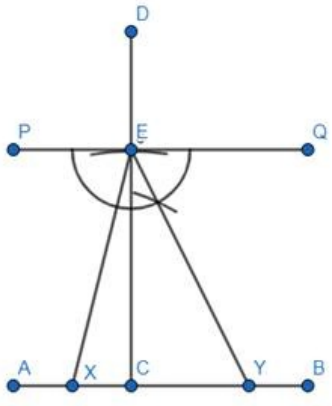
3. Along CD, set CE = 4.8 cm.



4. Through E, draw PQ parallel to AB.



5. Construct ∠ PEX = 30° and ∠ QEY = 60° meeting AB at X and Y respectively.



Therefore, Δ XEY is the required triangle.

Question: 12

Construct a ΔPQR

Solution:

According to the question, the sides are 3x, 2x and 4x.

Given perimeter = 12 cm

Therefore, 3x + 2x + 4x = 12

⇒ 9x = 12

⇒ x = 1.33 cm

Hence, the sides are 3.99 cm, 2.66 cm and 5.32 cm.

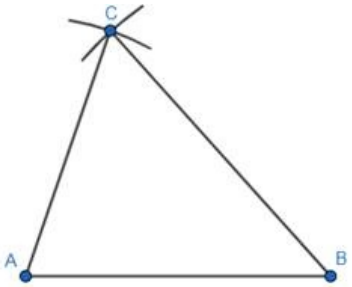
Steps of Construction:

1. Take AB = 5.32 cm and draw a line segment.

2. Measure 3.99 cm in ruler and draw an arc above AB from A. Again do the same for 2.66 cm but draw the arc from B.

3. Name the point where they intersect as C.

4. Join AC and BC.



Question: 13

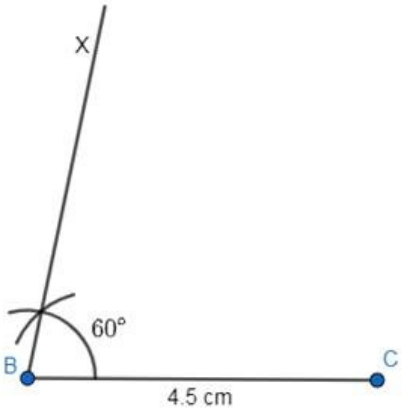
Construct a ΔABC

Solution:

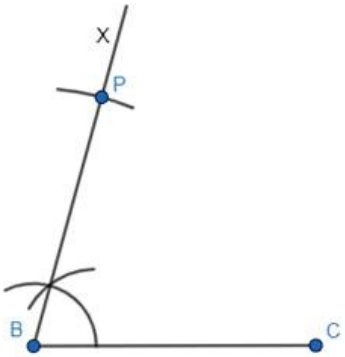
Steps of Construction:

1. Draw BC = 4.5 cm

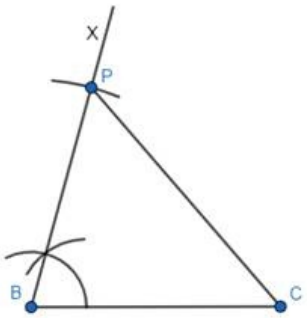
2. Construct ∠ CBX = 60°



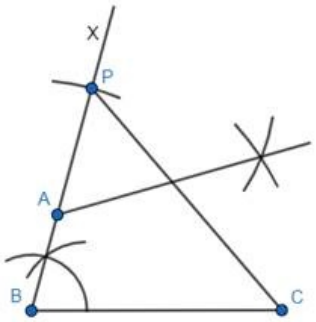
3. Along BX set off BP= 8 cm



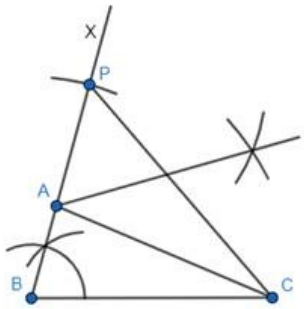
4. Join CP.



5. Draw the perpendicular bisector of CP intersecting BP at A.



6. Join AC.



Therefore, Δ ABC is the required triangle.

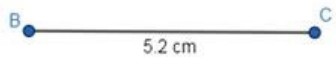
Question: 14

Construct a ΔABC

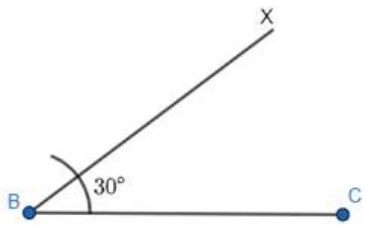
Solution:

Steps of Construction:

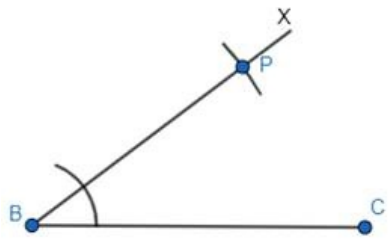
1. Draw BC = 5.2 cm



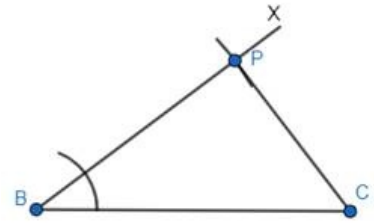
2. Construct ∠ CBX = 30°



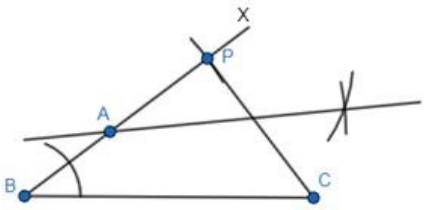
3. Along BX set off BP = 3.5 cm



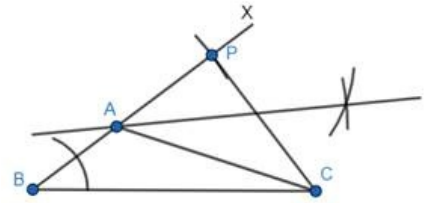
4. Join PC



5. Draw perpendicular bisector of PC meeting BP produced at A.



6. Join AC.



Therefore, Δ ABC is the required triangle.

Exercise : CCE QUESTIONS

Question: 1

Which of the foll

Solution:

On bisecting 45°, we get 22.5°. Hence, 22.5° can be drawn using ruler and compass.

Question: 2

Which of the foll

Solution:

We can make 135° by drawing 90° and 45°. On bisecting 135°, we get 67.5°. Hence, 67.5° can be drawn using ruler and compass.

Question: 3

Which of the foll

Solution:

Below angles can be drawn using following

120° = 90° + 30° or 60° + 60° (where 30° is the bisected angle of 60°)

135°= 90° + 45°

37.5° is the bisected angle of 75° and 75° can be drawn using 90° and 60°.

But 40° cannot be drawn.

Question: 4

Which of the foll

Solution:

Below angles can be drawn using following

On bisecting 45°, we get $22\frac{1}{2}^{\circ}$

15° is the bisected angle of 30°

$52\frac{1}{2}^{\circ}$ = 90° + 15°

But $32\frac{1}{2}^{\circ}$ cannot be drawn.

Question: 5

The construction

Solution:

For any triangle sum of the lengths of two sides is always greater than the length of third side.

So, BC + AC should be greater than 6 cm. Hence, BC + AC = 7 cm

Question: 6

The construction

Solution:

For any triangle sum of the lengths of two sides is always greater than the length of third side.

So, PQ + QR should be greater than 5.4cm. Hence, PQ + QR ≠ 5 cm

Question: 7

The construction

Solution:

For any triangle the length of each side of any triangle is greater than the difference between the lengths of the other two sides. So, BC – AC should be less than 7 cm. Hence, BC – AC = 6.5 cm

Question: 8

The construction

Solution:

For any triangle the length of each side of any triangle is greater than the difference between the lengths of the other two sides. So, AB – AC should be less than 6 cm. Hence, AB – AC ≠ 6 cm

Question: 9

Is it possible to

Solution:

For any triangle the length of each side of any triangle is greater than the difference between the lengths of the other two sides. Here, 12 – 7 = 5 cm this is equal to the length of the third side. Hence, such triangle is not possible.

Question: 10

Is it possible to

Solution:

For any triangle sum of the lengths of two sides is always greater than the length of third side.

The lengths of the sides are 5 cm, 6 cm, 10 cm.

(a) 5 cm + 6 cm > 10 cm.(b) 6 cm + 10 cm > 5 cm.(c) 5 cm + 10 cm > 6cm.Hence, a triangle with these sides is possible.

Question: 11

Is it possible to

Solution:

For any triangle the sum of the angles is equal to 180°. Here, ∠ B + ∠ C = 120° + 60° = 180° which means ∠ A=0°. Hence, such triangle is not possible.

Question: 12

Is it possible to

Solution:

For any triangle the sum of the angles is equal to 180°. Here, ∠ A + ∠ B + ∠ C = 60° + 70° + 60° =190°.

Hence, such triangle is not possible.

Question: 13

Is it possible to

Solution:

$$35° = \frac{1}{2}(70°) = \frac{1}{2}(40° + 30°)$$

Hence, 35° cannot be constructed.

Question: 14

Is it possible to

Solution:

$$67.5° = \frac{1}{2}(135°) = \frac{1}{2}(90° + 45°)$$

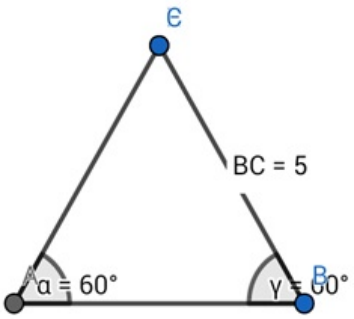
Hence, 67.5° can be constructed.

Exercise : FORMATIVE ASSESSMENT (UNIT TEST)

Question: 1

Is it possible to

Solution:



Any triangle can be constructed with any value of two angles and length of the side included

within them.

As can be seen from the figure, it is obviously possible to construct any ΔABC with given two angles and the side included with them.

So, the correct option is (A)

Question: 2

Is it possible to

Solution:

For any triangle sum of the lengths of two sides is always greater than the length of third side.

Here, 5 cm + 5 cm = 10 cm.Hence, a triangle with these sides is not possible.

Question: 3

Is it possible to

Solution:

$$75° = \frac{1}{2}(150°) = \frac{1}{2}(90° + 60°)$$

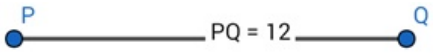
Hence, 75° can be constructed.

Question: 4

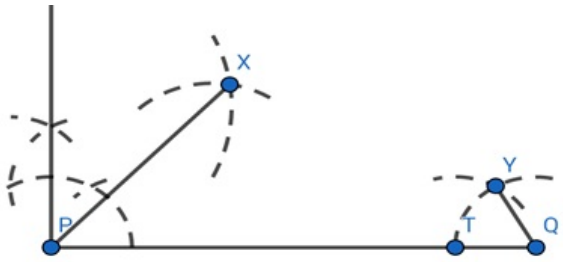
Construct a ΔABC

Solution:

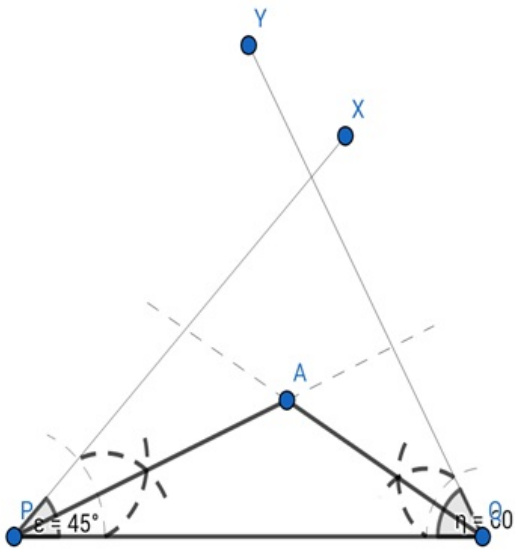
Step 1: Draw the line segment PQ = 12cm



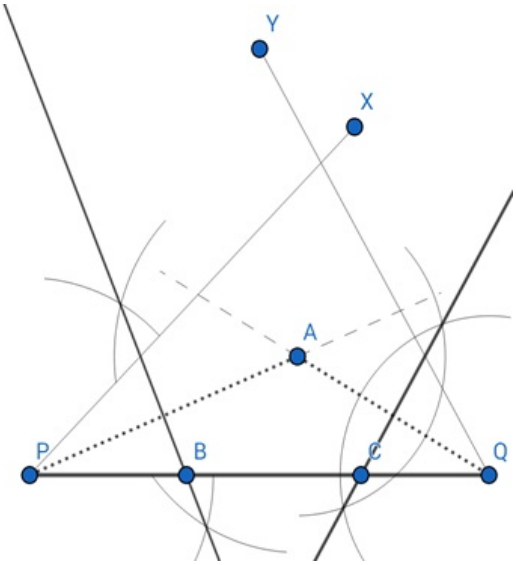
Step 2: Construct the base angles at P and Q i.e. <XPQ=45° and <YQP=60°



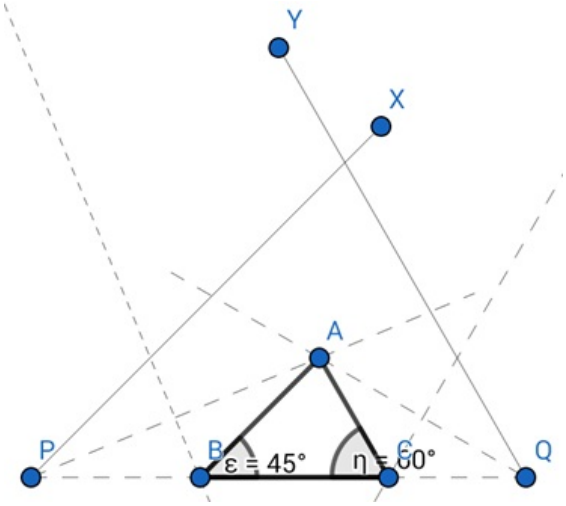
Step 3: Bisect <XPQ and <YQP to meet at A



Step 4: Perpendicularly bisect AP and AQ to meet the bases at B and C respectively



Step 5: Join AB and AC to get the required triangle



So, ΔABC is the required triangle

AB+BC+BC = 12cm

Base angles <ABC=45° and <ACB=60°

Question: 5

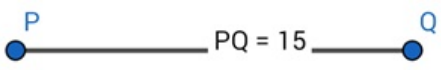
Construct a ΔABC

Solution:

The sides of the triangle are in the ratio 3:4:5

Now, 3+4+5 = 12

Step 1: Construct PQ = 15cm

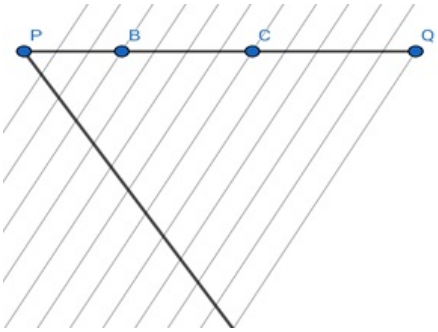


Step 2: We have to divide PQ into 12 equal parts and consider the 1st three, the next four and the last five seperately for construction

A line inclined with any arbitary angle with the line PQ is drawn with the help of scale and pencil.

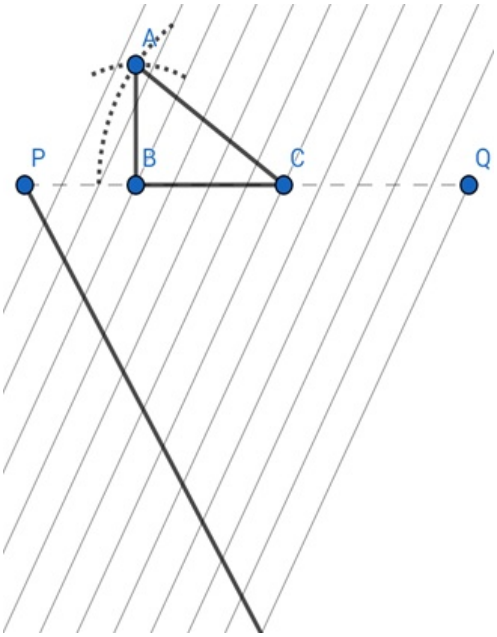
12 equal parts are taken with the help of compass and after joining the end points of both the lines, parallel lines are drawn with the help of pencil and set squares.

The line PQ is thus equally divided and points B and C are named.



Step 3: Arcs with B as centre and PB as radius and C as centre and CD as radius are intersected at A.

A,B and A,C is joined to yield the required triangle.



ΔABC is the required triangle with AB:BC:AC = 3:4:5

PQ = 15cm

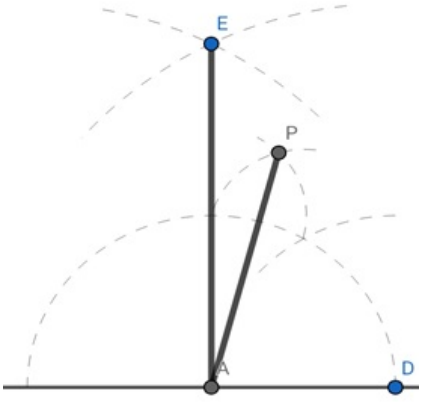
AB+BC+AC = 15cm

Question: 6

Construct an isos

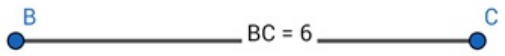
Solution:

Step 1: Construction of 75° and 90° is shown separately.

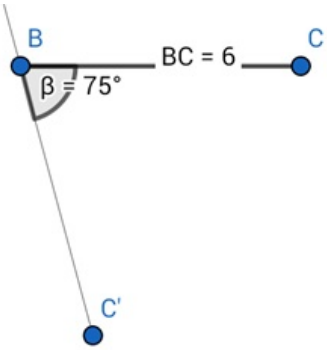


Here, <DAP = 75° and <DAE = 90°

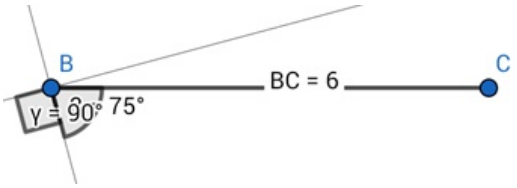
Step 2: The base of the triangle BC is drawn equalling to 6cm



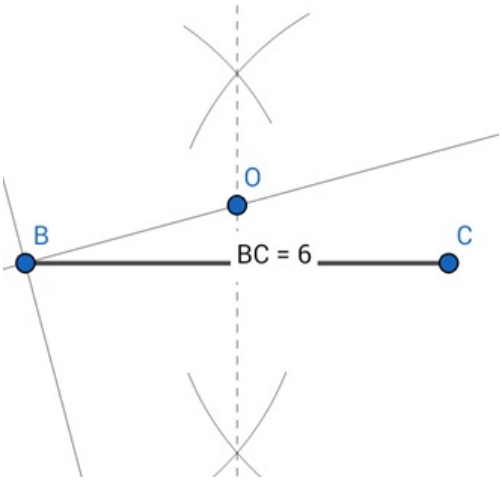
Step 3: An angle of 75° is constructed on the lower side of BC in a method shown previously



Step 4: Construct a right angle on the line BC’

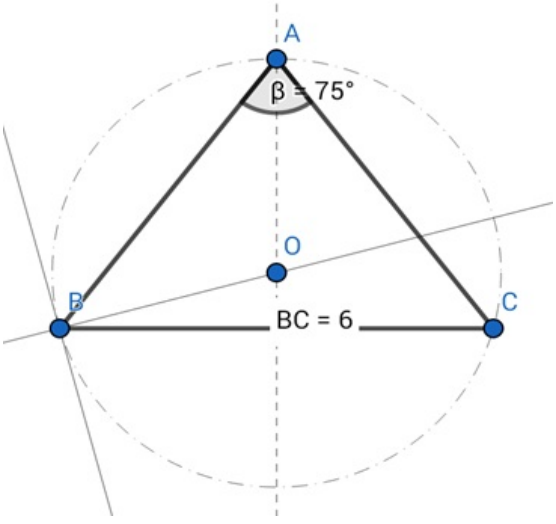


Step 5: Construct the perpendicular bisector of BC to meet the previously constructed perpendicular at O



Step 6: A circle is constructed with centre O and radius OB to meet the perpendicular bisector at A.

A,B and A,C are joined.



ΔABC is the required figure

BC = 6cm

AB = AC

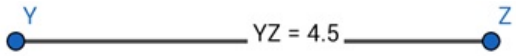
The vertical angle <BAC = 75°

Question: 7

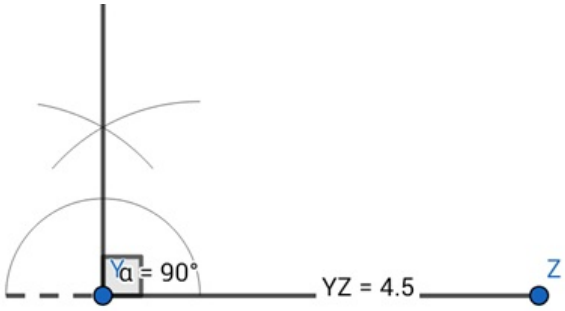
Draw a right-angl

Solution:

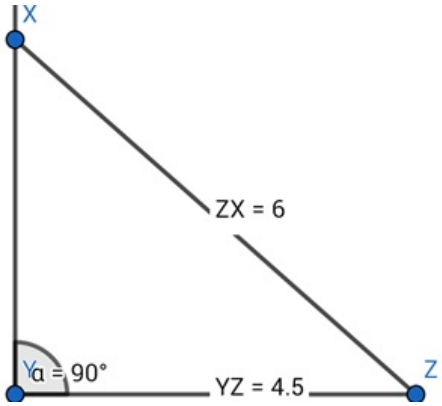
Step 1: Construct the base = 4.5 cm



Step 2: Construct a right angle at Y



Step 3: Cut off a length of 6cm from point Z on the perpendicular to yield the point X



ΔXYZ is the required right-angled triangle

YZ = 4.5cm

Hypotenuse XZ = 6cm

Question: 8

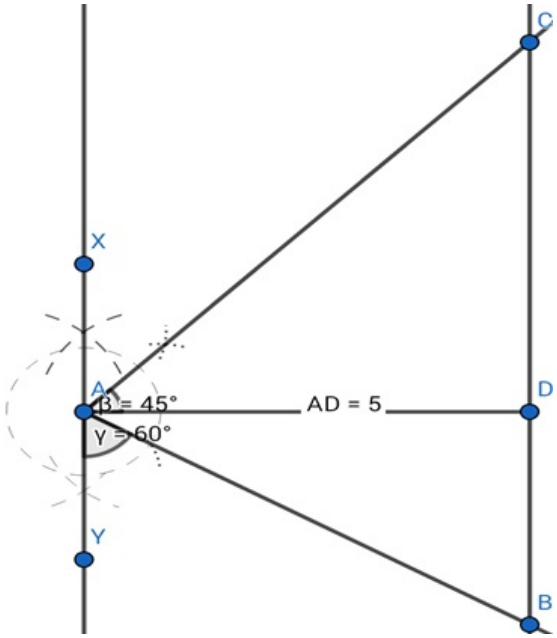
Construct a ΔABC

Solution:

Step 1: The perpendicular AD is taken as the base and the 5cm length is constructed.

Step 2: An angle of 45° is constructed at A to form <XAC and 60° to form <YAB

The points C and B fall on the line perpendicular through D



ΔABC is the required triangle

<B = 60°

<C = 45°

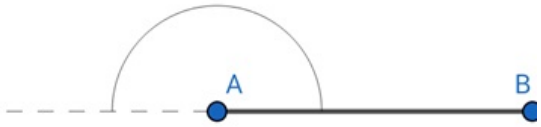
AD = 5cm

Question: 9

Construct an angl

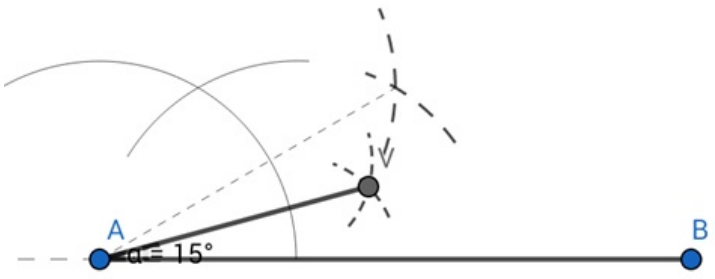
Solution:

Step 1: Construct a line segment or arbitrary length an take an semi-circular arc on the line

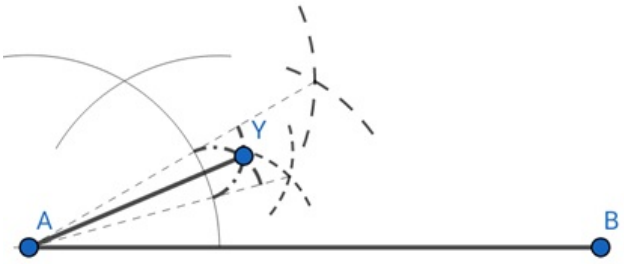


Step 2: Taking the same radius, an arc is cut on the semi-circular arc to give 60°

Step 3: This 60° is further bisected and the lower 30° is bisected again to yield 15°



Step 4: The upper 15° is bisected to give 7.5°



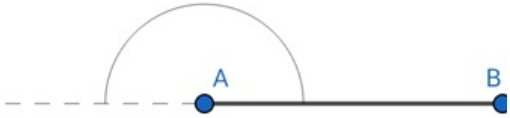
<BAY = 22.5°

Question: 10

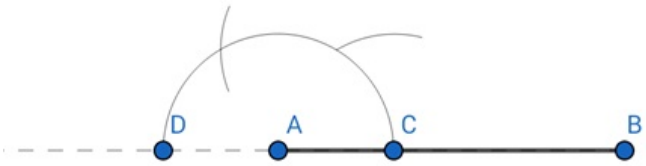
Construct an angl

Solution:

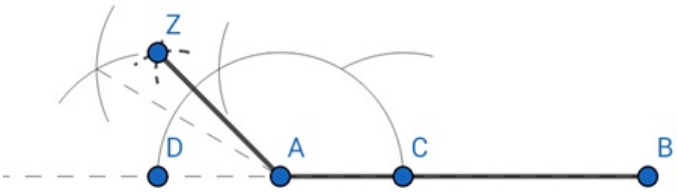
Step 1: Construct a line segment or arbitrary length an take an semi-circular arc on the line



Step 2: Two arcs of the same radius are cut on the semicircle



Step 3: The last 60° is divided twice to give 15°



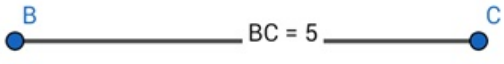
<BAZ = 135°

Question: 11

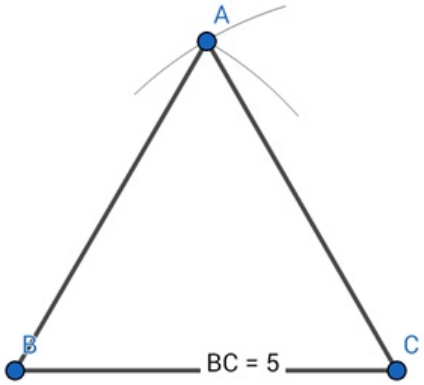
Construct an equi

Solution:

Step 1: Construct the base of the triangle equalling 5cm



Step 2: Taking the same length as radius cut arcs centred at B and C to meet at A



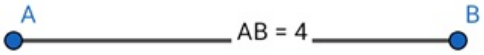
ΔABC is the required triangle with AB=BC=CA=5cm

Question: 12

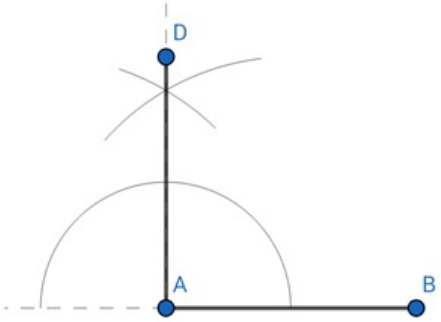
Construct a squar

Solution:

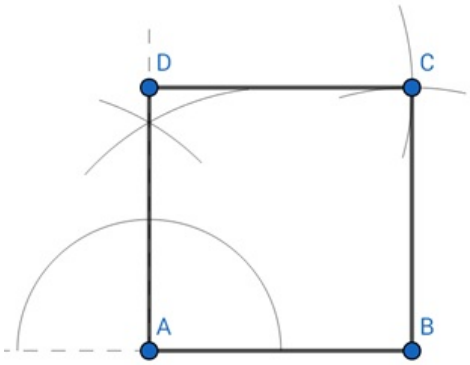
Step 1: Construct base = 4cm



Step 2: An angle of 90° is constructed at A and 4cm length is cut off



Step 3: Arcs of radius 4cm with centres at D and B are cut off and the point of intersection A is joined with D and B



ABCD is the required square with AB=BC=CD=DA=4cm

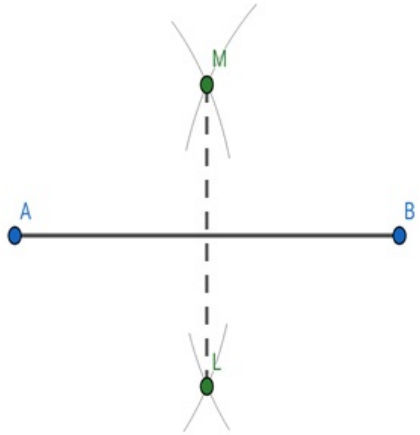
Question: 13

Draw a line segme

Solution:

Step 1: A line segment AB of length 5.2cm is constructed

Step 2: Arc radius of any arbitrary length is taken in compass and arcs are cut off centring at A and B on both sides of the line segment and joined to get the required perpendicular bisector



AB = 5.2cm

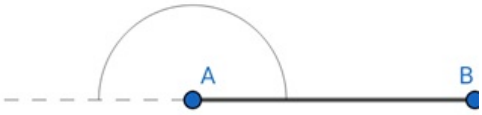
ML is the perpendicular bisector of AB

Question: 14

Construct an angl

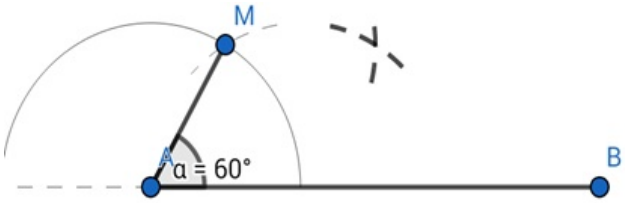
Solution:

Step 1: Construct a line segment or arbitrary length an take an semi-circular arc on the line



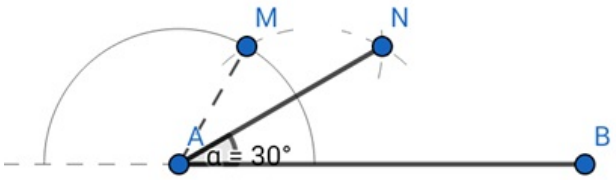
Step 2: Taking the same radius, an arc is cut on the semi-circular arc to give 60°

Step 3: The 60° thus formed is bisected by taking any arbitrary radius and cutting of arcs centring at the two intersection points to yield a 3rd intersection



<MAB = 60°

Step 4: The deeper point of intersection is joined with point A and thus the angle is bisected to give 30°



<MAB = 60°

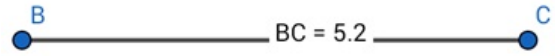
<NAB = 30°

Question: 15

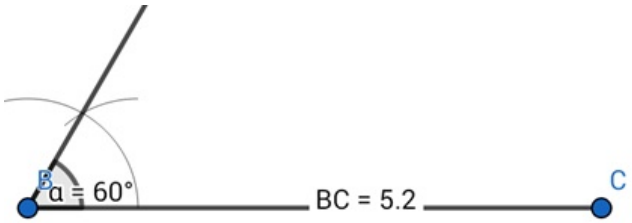
Construct a ΔABC

Solution:

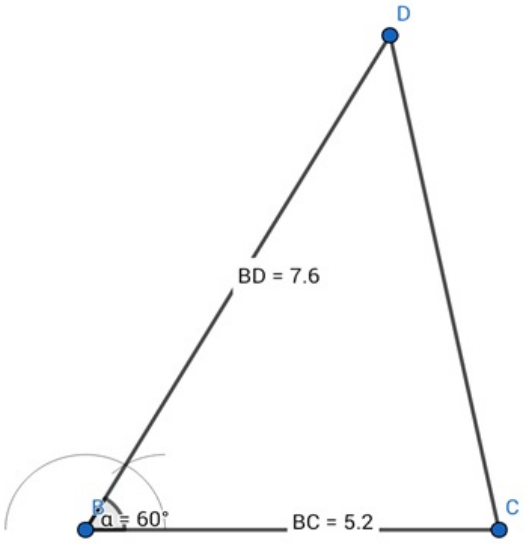
Step 1: Base BC of length 5.2cm is constructed



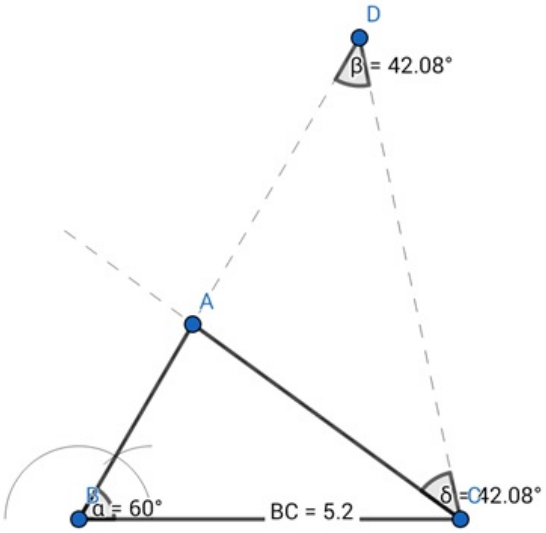
Step 2: Construct an angle of 60° at B



Step 3: Cut off BD = 7.6cm on this ray of the angle and join points D and C



Step 4: An angle equal to <BDC is constructed at C and the ray meets the line segment BD at A to give the required triangle



ΔABC is the required triangle.

BC = 5.2cm

BD = BA+AD = BA+AC = 7.6cm

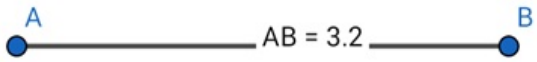
<ABC = 60°

Question: 16

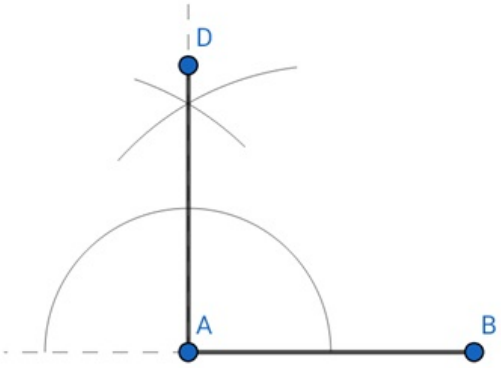
Construct a squar

Solution:

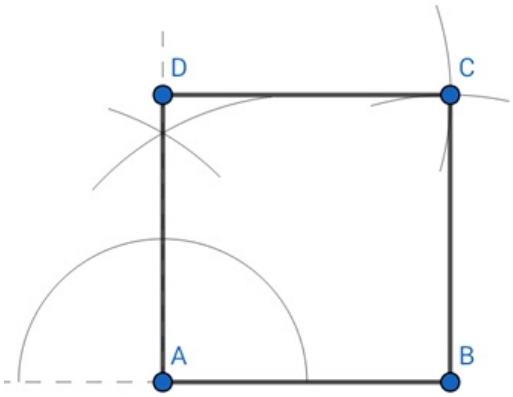
Step 1: Construct base = 3.2cm



Step 2: An angle of 90° is constructed at A and 3.2cm length is cut off



Step 3: Arcs of radius 3.2cm with centres at D and B are cut off and the point of intersection A is joined with D and B



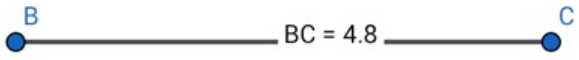
ABCD is the required square with AB=BC=CD=DA=3.2cm

Question: 17

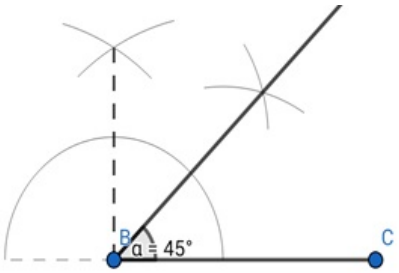
Construct a ΔABC

Solution:

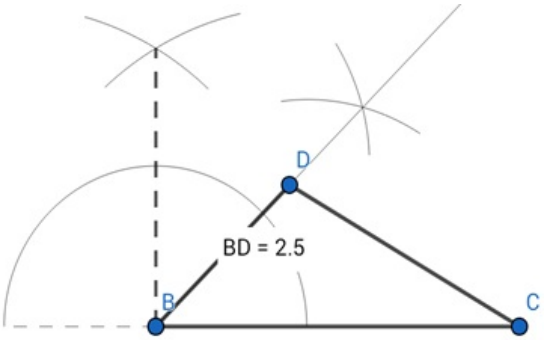
Step 1: The base BC = 4.8cm is constructed



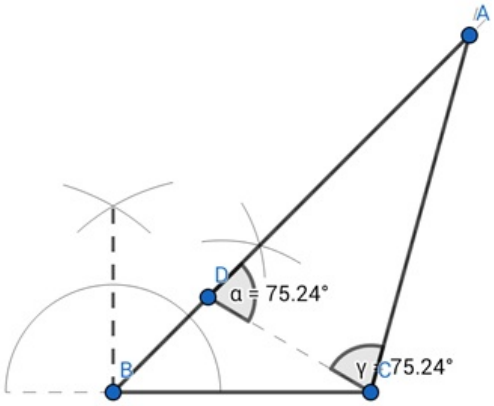
Step 2: An angle of 45° is constructed at B



Step 3: 2.5cm length BD is cut off from the ray and points D and C are joined



Step 4: An angle equal to the exterior angle of D is constructed at C and the two rays are made to join at point A



ΔABC is the required triangle

BC = 4.8cm

BD = AB-AD = AB-AC = 2.5cm

<B = 45°